

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P932 - PCT	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> FOR FURTHER ACTION </div> <div style="text-align: right;"> see Form PCT/ISA/220 as well as, where applicable, item 5 below. </div> </div>	
International application No. PCT/JP2004/019458	International filing date (day/month/year) 17.12.2004	(Earliest) Priority Date (day/month/year) 22.12.2003
Applicant SHOWA DENKO K.K.		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☒ **Unity of invention is lacking** (See Box III).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the drawings to be published with the abstract is Figure No. 5

☒ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The inventions of claims 1-8 are linked to be one another only in respect of the feature "a first layer which is in contact with the substrate is composed of silicon-doped $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$)". However, this feature is disclosed in a prior art document WO 02/17369 A1 (SHOWA DENKO K.K.), 28.02.2002. So the feature cannot be a special technical feature. And there exists no special technical feature linking the inventions of claims 1-8 as to form a single general inventive concept among the inventions. Therefore there are no technical relationship which is considered as "special technical feature" (PCT rule 13.2) among the claims 1-6. So this application contains the following groups of invention which are not so linked as to form a single inventive concept under PCT rule 13.2.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐
☐

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP 2004/019458

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl⁷ H01L33/00 H01L21/205

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl⁷ H01L33/00 H01L21/205

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 Japanese Utility Model Gazette 1922-1996, Japanese Publication of Unexamined Utility Model Applications 1971-2005, Japanese Registered Utility Model Gazette 1994-2005, Japanese Gazette Containing the Utility Model 1996-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2002/17369 A1 (SHOWA DENKO K.K.) 28.02.2002, Whole document, Figures 1-10 & AU	1, 2, 4, 7-10
Y	8009701 A & GB 2372635 A & JP 2004-507106 A & TW 546850 B & US 2002/155712 A1	3, 5, 6
Y	JP 10-125608 A (SHOWA DENKO K.K.) 15.05.1998, Whole document, Figures 1-17 (Family: None)	1-8
Y	JP 2003-63895 A (NICHIA KAGAKU KOGYO KK) 05.03.2003, Paragraph [0022]-[0024], Figure 1 (Family: None)	3
Y	JP 2002-313739 A (NICHIA KAGAKU KOGYO KK) 25.10.2002, Paragraph [0019]-[0021], Figures 1-3, (Family: None)	3
Y	JP 2002-100575 A (NICHIA KAGAKU KOGYO KK) 05.04.2002, Paragraph [0027] (Family: None)	1-8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19.01.2005

Date of mailing of the international search report

08.2.2005

Name and mailing address of the ISA/JP

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International application No.

PCT/JP2004/019458

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-261032 A (NICHIA KAGAKU KOGYO KK) 13.09.2002, Paragraph [0030] & AU 7454501 A & CA 2412999 A1 & CN 1441982T T & EP 1320870 A2 & TW 508841 B & US 2003/032288 A1 & US 2001/053618 A1 & US 2003/160232 A1 & WO 2001/99155 A2	1-8
Y	WO 2000/04615 A1 (FUJITSU LIMITED) 27.01.2000, Whole document & US 6606335 B1	1-8
A	JP 2003-171200 A (CANON KK) 17.06.2003, Whole document (Family: None)	1-10
A	JP 6-151962 A (TOYODA GOSEI KK) 31.05.1994, Whole Document (Family: None)	1-10
A	JP 4-297023 A (NICHIA KAGAKU KOGYO KK) 21.10.1992, Whole Document & DE 69203736D D1 & EP 0497350 A1 & KR 9506968 B1 & US 5290393 A	1-10